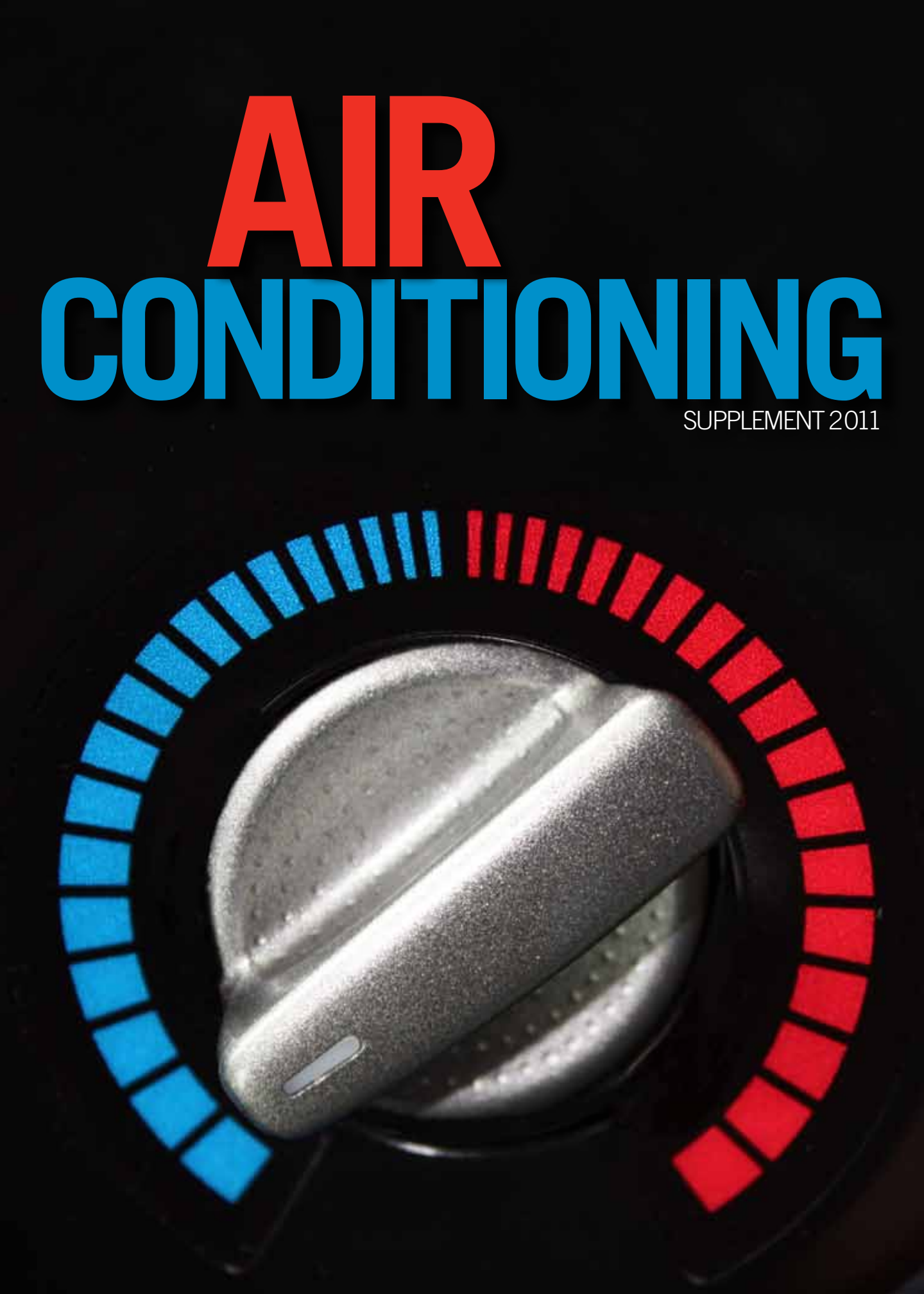
AIR CONDITIONING

SUPPLEMENT 2011



Mark Lemay

Case Study

2006 Chevrolet Cobalt A/C

This vehicle came in for a customer complaint of insufficient cooling from the A/C System. The air from the vent was cool but not cold.

A quick visual check revealed no problems and since this vehicle has a pressure sensor in the high side line, a scan tool was hooked up and the pressure was taken before the vehicle was started up. (Fig. 2) The ambient air temperature was 73°F and the system pressure measured at 74 psi.

Test procedure

This test verifies that the system has a minimum refrigerant charge. The system met the specification in the service manual. Next the vehicle was started, the centre duct temperature and the high and low side pressures were taken using a manifold gauge set. The readings were then compared to the performance chart (Fig. 3) from the service manual. All readings were taken with the doors closed, the A/C set to high blower and recirculation mode selected. The driver's door window was opened 6 inches as per the test procedure.

Our vehicle measured a duct temperature of 57°F, a low side pressure of 27 psi and a high side pressure of 196 psi. When these reading were compared to the charts, the readings were just within the system limits on pressure, but the duct temperature was a little high.

Next step

With no clear direction, a temperature test was called for. Temperature testing involves taking readings at the evaporator and condenser inlet and outlet lines and comparing them to a chart. (Fig. 1 and Fig. 4). This test is conducted with all the doors open, the vehicle exposed to sunload if possible, the engine slightly above idle (around 1000 rpm) and the A/C turned to the MAX position.

When tested in this manner our vehicle readings were as follows: condenser inlet temperature 135°F, condenser outlet temperature 72°F, evaporator inlet temperature 37°F and the evaporator inlet temperature measured 31°F. When compared to the charts this indicates that the system is undercharged.

Leak test

An electronic leak detector was used and the hoses, connections and heat exchangers were carefully checked with no signs of leaks evident. The gauges were removed and a dye was injected into the system.

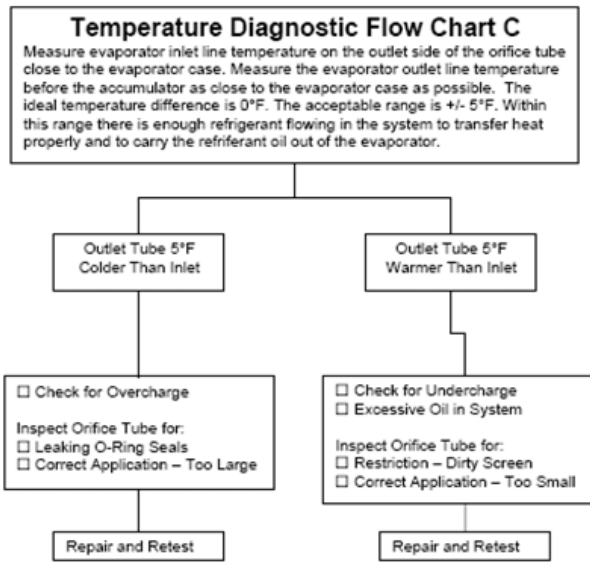

Temperature Diagnostic Flow Chart C
Measure evaporator inlet line temperature on the outlet side of the orifice tube close to the evaporator case. Measure the evaporator outlet line temperature before the accumulator as close to the evaporator case as possible. The ideal temperature difference is 0°F. The acceptable range is +/- 5°F. Within this range there is enough refrigerant flowing in the system to transfer heat properly and to carry the refriferant oil out of the evaporator.
Outlet Tube 5°F Colder Than Inlet
Outlet Tube 5°F Warmer Than Inlet
☐ Check for Overcharge
Inspect Orifice Tube for:
☐ Leaking O-Ring Seals
☐ Correct Application – Too Large
☐ Check for Undercharge
☐ Excessive Oil in System
Inspect Orifice Tube for:
☐ Restriction – Dirty Screen
☐ Correct Application – Too Small
Repair and Retest
Repair and Retest

Fig. 1

25-29ºC (76-85ºF)	Below 35%	172-234kPa (25-34 psi)	999-1371 kPa (145-199 psi)	10ºC (50ºF)
	35-50%	179-241 kPa (26-35 psi)	1067-1433 kPa (155-208 psi)	10ºC (50ºF)
	above 50%	186-248 kPa (27-36 psi)	1123-1543 kPa (163-224 psi)	12ºC (52ºF)

Fig.2

When the dye injector was removed, a bubble formed in the service port that the dye had been injected into. The leak detector was placed under the fitting and sure enough, the detector started to tick. The system was drained, a new Schrader valve was installed, the system was recharged and tested for leaks and received a pass this time around.

The system was tested again for proper temperatures and outlet duct temperature. All temperatures fell within the normal range and our duct temperature dropped from 57°F to 45°F.

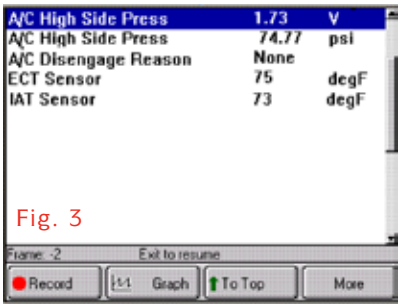


Fig. 3

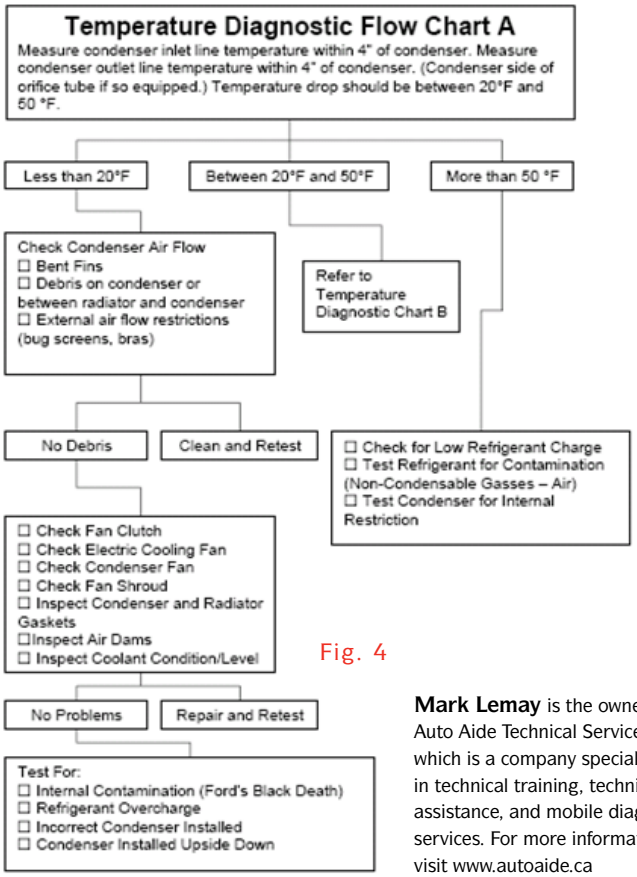

Temperature Diagnostic Flow Chart A
Measure condenser inlet line temperature within 4" of condenser. Measure condenser outlet line temperature within 4" of condenser. (Condenser side of orifice tube if so equipped.) Temperature drop should be between 20°F and 50 °F.
Less than 20°F
Between 20°F and 50°F
More than 50 °F
Check Condenser Air Flow
☐ Bent Fins
☐ Debris on condenser or between radiator and condenser
☐ External air flow restrictions (bug screens, bras)
Refer to Temperature Diagnostic Chart B
No Debris
Clean and Retest
☐ Check for Low Refrigerant Charge
☐ Test Refrigerant for Contamination (Non-Condensable Gasses – Air)
☐ Test Condenser for Internal Restriction
☐ Check Fan Clutch
☐ Check Electric Cooling Fan
☐ Check Condenser Fan
☐ Check Fan Shroud
☐ Inspect Condenser and Radiator Gaskets
☐Inspect Air Dams
☐ Inspect Coolant Condition/Level
No Problems
Repair and Retest
Test For:
☐ Internal Contamination (Ford's Black Death)
☐ Refrigerant Overcharge
☐ Incorrect Condenser Installed
☐ Condenser Installed Upside Down

Fig. 4

Mark Lemay is the owner of Auto Aide Technical Services which is a company specializing in technical training, technical assistance, and mobile diagnostic services. For more information visit www.autoaide.ca

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Trends

Interview with MACS Expert in A/C Systems

Everyone who has visited MACS worldwide annual convention which takes place at the end of January in the US, has either heard about, or attended, Paul De Guiseppi's training seminars. In this article, Paul explains where we are now and where the A/C industry is heading.

Paul De Guiseppi has been working in the automotive industry since 1985, and has been employed by MACS since 1997. He travels to Uncle Sam's major cities throughout the year to present A/C clinics and training sessions on behalf of MACS (Mobile Air Conditioning Society). We've asked him a few pertinent questions to find out more about the pulse of this industry:

What would you say was the main highlight at the last MACS convention?

Definitely the quality of the training sessions presented and the huge attendance, which clearly showed the interest and motivation that drives A/C industry stakeholders. I counted more than 25 sessions dealing with different topics for passenger vehicles as well as heavy duty equipment, all presented by renowned industry specialists.

What do you think made these seminars such a blockbuster?

This year (and for the first time, by the way), we partnered with AVI (Automotive Video Incorporated), who helped bring together leading experts to talk about such a wide variety of topics. We had case studies, demonstrations, clinics on system diagnosis, electronics, new refrigerants and equipment, and a bunch of outstanding speakers from Denso, CNH, ACC Climate Control, Caterpillar, etc.

What is your feeling about the future of A/C systems and technologies?

Since automobile A/C systems are getting smaller, use less refrigerant and have much tighter leaking tolerances, they will keep getting more complicated and more difficult to diagnose. Furthermore, they'll need to comply with regulations that will become increasingly more stringent. More hi-tech equipment is now required to 'do the job right' in the diagnosis and decision process. And that means skilled technicians will need to stay updated by all possible means. Attending training seminars, webinars, trade shows and conventions like MACS, reading specialized magazines as well as online browsing are all great ways for the professional technician to make sure he does his work right according to regulations and the car manufacturer's specifications and requirements.

> **"Skilled technicians must stay updated by all means possible."**

What do you know about the commercialization of the HFO-1234yf refrigerant?

In the US, GM has announced that they will equip their entire 2013 vehicle production with this new refrigerant. For the aftermarket segment, there will be no retrofit allowed or even available. The refrigerant is not yet available on the market on a large scale and its ID acronyms are either HFO-1234yf or R-1234yf.

How are the repair and equipment testing companies doing?

No equipment of any kind is available so far to handle this refrigerant, but they're working on it. Since it's a slightly flammable gas, safety features will have to be built into this new equipment. There is also no existing equipment or device on the market to identify it as yet.

What is the trend in Europe?

They are still using the R-134a but plan to switch to HFO-1234yf, too. There will probably be some 2012 models sold later this year there that will use it, with more to follow early next year and beyond.

NOTE: Spectra Premium has invited Paul De Guiseppi to present a training seminar on A/C systems at their facility in Boucherville on Wednesday, May 18, 2011.

Paul De Guiseppi is Manager, MACS Training Services, and an ASE Certified Master (L1) in Automotive Mechanics.

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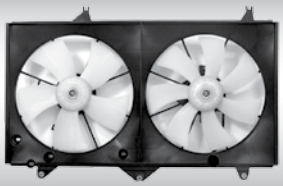

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> by François Charron
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Automobile Refrigerants

The Situation Today

The death knell is about to ring for the hydro fluorocarbon (HFC) R134a, which has a high potential for contributing to global warming and which has already been banned for all new vehicles sold in Europe this year. And the US Environmental Protection Agency (EPA) is about to follow suit...

In 2006, HFC regulations were adopted in Europe to forbid the use of gases with a Global Warming Potential (GWP) greater than 150 (i.e. 150kg of CO_2) which set in motion a progressive ban on R134a. This fluid is no longer authorized for new vehicles manufactured this year and will be eliminated in all vehicle models, as from 2017.

Environmental pressure

After worldwide pressure to eliminate HFCs (including R134a), a petition, organized by three US-based NGOs* (Non-Governmental Organizations), was presented to the EPA. The EPA consequently decided to forbid its use, although a timetable for elimination of this refrigerant in US-manufactured vehicles has not yet been fixed.

Since the new HFO-1234yf refrigerant (with a GWP of 4, compared with a GWP of 150 for R134a), was approved by the EPA on February 24 of this year for all regular and SUV vehicles production, the days of R134a have been numbered. Furthermore, among other advantages of HFO-1234yf, it's good to know that it requires very few modifications to work well in current air conditioning systems.

Rejected solutions

Among other alternative solutions studied and approved by the EPA, there was the HFC-152a refrigerant which uses hydrogen, a very flammable gas (with a GWP of 140) and CO2-based R744 (with a GWP of 1), which raised major technical problems requiring modification of the air conditioning system and added a 30% cost increase for manufacturers. Furthermore, HFO-1234yf will be used in new European car models, starting this year.

Price Hike

The use of HFO-1234yf could also be accelerated by the increase in price of R134a. Already hit with a 25% price increase as of last year, Dupont and Honeywell announced recently that they would be forced to further increase the price of R134a (+15% at Honeywell) because of the extra cost of the raw materials (trichloroethylene and perchlorethylene) used to make it.

"HFO-1234yf will be used in new European car models, starting this year."

Standards and tolerances regarding the components manufactured for the latest air conditioning systems match with more ecological refrigerants.

* The NRDC (Natural Resources Defense Council), the IGSD (Institute for Governance and Sustainable Development) and the EIA (Environmental Investigation Agency) all assert that the elimination of R134a would mean a reduction equivalent to 100 billion tons of CO_2. R134a, alone, has a Global Warming Potential (GWP) 1,300 times higher than that of CO_2.

Improved Leak Detector

This refrigerant gas leak detector features a long life solid electrolyte sensor technology that is designed to detect the more current and difficult HFC refrigerants such as R-134a, R-410a, R-404a, R-407c, and R507 in addition to all HCFC (R22) and CFC (R12) refrigerants including SNAP approved hydrocarbon blends. The unique digital leak size indicator of the 580951 model takes the guesswork out of whether or not to repair a small leak. The digital display is independent from the audio alarm and sensitivity level, allowing the precise pinpointing of the leak source.

www.cliplight.com

Recovery Recycling Recharging Station

The AR2700 is the latest CPS technology in semi-automatic recovering, evacuating and recharging refrigerants. Equipped with a 1/3 HP reciprocating compressor, it has a built in condenser for high ambient temperature operation, a built in evaporator to protect the compressor against flood-back, a 16 cu in filter drier and a 0.7 micron oil separator. The automatic charging sequence is programmable and the AR2700 can handle most common refrigerants on the market.

www.cpsproducts.com

Dual Recycle Guard

Manufactured by Airsept, a company whose products are used or recommended by 16 automakers, the new dual automatic recycle guard traps debris, sealant and other contaminants that could enter a car's air conditioning system. No technical input is required and it switches automatically from recover to recharge. The unit also connects to both high and low sides simultaneously and can be installed on all major A/C service equipment brands.

www.airsept.com

LED Work Light

Brighter than a 75 watt bulb, the new Hemiplus rechargeable cordless LED work light manufactured by Cliplight offers more than 8 hours of continuous run time. The handy tool projects a broad and solid light pattern that illuminates the entire engine compartment with no shadows or hot spots. Its modular design is very ergonomic and all parts are user replaceable. The recharge of the lithium ion battery is achieved within 4 hours and the charging station can work on either 110-240v input.

www.cliplight.com

Refrigerant Identifier

With its innovative and ergonomic design, the Neutronics Ultima ID refrigerant identifier can rapidly analyse and identify EPA SNAP approved blends on a large graphing display as well as the percentages present in automotive A/C systems. Versatile and easy to use, this high tech tool is equipped with a built in rechargeable power pack and car battery clips and a built in printer for easy customer billing.

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